

Refresher Math Problem Set C1 – Percent Basics

(Percent Definition, Fraction-Decimal-Percent Conversions, Finding Percent of a Number)

Ground Rules for Problem Set Completion

1. Present your work in a neat and organized manner. Use complete sentences whenever you are asked to make a statement.
2. SHOW YOUR WORK: Credit is awarded for all reasonable attempts based on the work shown.
3. Make sure you answer ALL parts of problems.
4. Complete and submit ALL Problem Sets for the unit prior to taking the Unit Test.

I. REVIEW PROBLEMS

The problems below provide practice with skills and concepts covered in Units A and B. To help you review, I've noted related sample problems in brackets. (For example, [A3:1 p3] tells you that part 3 of Sample Problem 1 in Problem Set A3 is similar to the problem at hand.)

A. Answer the following questions about fractions and mixed numbers.

1. Use a sketch to represent the fraction $\frac{9}{15}$. [A3:1 p1]
2. Use a sketch to represent the mixed number $5\frac{6}{8}$. [A3:2 p1]
3. Reduce $\frac{9}{15}$ to lowest terms.
4. Reduce $5\frac{6}{8}$ to lowest terms.
5. Find the sum of $\frac{9}{15}$ and $5\frac{6}{8}$. [A3:2 p4]
6. Find the difference between $5\frac{6}{8}$ and $\frac{9}{15}$. [A3:2 p5]
7. Find the product of $5\frac{6}{8}$ and $\frac{9}{15}$. [A3:5]
8. Find the quotient of $5\frac{6}{8}$ divided by $\frac{9}{15}$. [A3:7]

B. Answer the following questions about decimals.

1. Convert $\frac{9}{15}$ to a decimal. [B1:5]
2. Convert $5\frac{6}{8}$ to a mixed decimal. [B1:7]
3. Convert two hundred seventy-eight thousandths to a fraction in lowest terms. [B1:6]
4. Convert 25,216.546 to a mixed number in lowest terms. [B1:8]
5. Express 25,216.546 in words. [B1:2]
6. Round 25,216.546 to the indicated place values. [B1:3]
 - a. nearest tenth
 - b. nearest ten
 - c. nearest hundredth

FOR PROBLEMS C THROUGH K: SIMPLIFY BY PERFORMING THE INDICATED OPERATIONS. FOR FRACTION PROBLEMS, GIVE YOUR ANSWER AS A PROPER FRACTION OR MIXED NUMBER IN LOWEST TERMS.

C. $3.08 + 5.2 * 6.54 =$

D. $(3.08 + 5.2) * 6.54 =$

E. $2\frac{7}{10} \bullet 6\frac{2}{3} =$

F. $34 - 12 \div 6 + 5 =$

G. $5\frac{5}{6} \div 1\frac{3}{4} =$

H. $\$20 - \$2.59 \bullet 5 =$

I. $4\frac{2}{5} + \frac{3}{8} =$

J. $(34 - 12) \div (6 + 5) =$

K. $7\frac{3}{8} - 3\frac{7}{16} =$

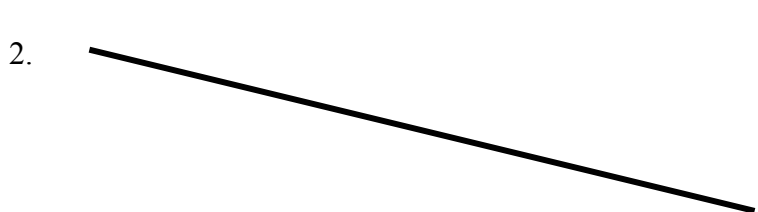
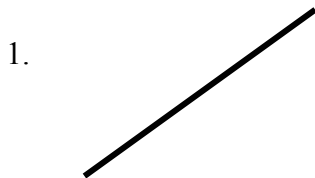
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For Problems L through R, completely solve all parts using steps (i), (ii), and (iii) below.

- i. State what it is you are to find. Give your answer as a complete sentence.
- ii. Solve the problem, showing your work.
- iii. State the answer in a complete sentence.

- L. Tim is going to make biscuits and cookies for the local homeless shelter. The biscuit recipe uses $\frac{2}{3}$ cup of milk and makes 1 dozen biscuits and the cookie recipe calls for $\frac{1}{4}$ cups of milk for each dozen cookies. He has 3 quarts (12 cups) on hand before he starts baking. He plans to make 30 biscuits and 4 dozen cookies. Determine how many cups of milk he will use in making the biscuits.
- M. Determine how much milk Tim will have left after making the biscuits and cookies in Problem L.
- N. Jerry knows that two-fifths of his class is boys. If there are a total of 25 students in his class, how many are girls?
- O. After driving 254 miles it took 10.6 gallons to fill the gas tank on Mary's car. If the gas tank on Mary's car holds a total of 13.2 gallons, how far could she drive on one tank of gas at this mileage? Round to the nearest tenth of a unit during your calculations.
- P. Pete has been making shelves. As a result, he has three boards left over. The boards are $9\frac{3}{4}$ inches, $17\frac{1}{2}$ inches, and $15\frac{5}{8}$ inches long. What is the total length of the boards?
- Q. Judy bought four TV dinners at \$2.69 each and a dozen eggs for \$1.89. How much change should she get if she pays with a twenty-dollar bill?
- R. XYZ stock started the day at $28\frac{3}{8}$ and finished at $25\frac{3}{4}$. How many points did the stock drop that day?
- S. Measure each line below to the nearest tenth of a centimeter.



II. THE MEANING OF PERCENT

The word “percent” means “in every 100”. For example, if a computer chip maker has a failure rate of two percent we know that, on average, 2 in every 100 chips will fail. We can express this failure rate as $\frac{2}{100}$. Thus, a percent can be viewed as a fraction with a denominator of 100. [Note: Anytime you see the root word *cent* it is a reference to 100. Examples: There are 100 years in a *century*, 100 *centimeters* in a meter, 100 *cents* in a dollar, and a *centurion* was a Roman soldier in charge of 100 men.]

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SAMPLE PROBLEM 1 WITH SOLUTION

State (a) the percent represented by each of the following situations, then (b) write this percent as a fraction with a denominator of 100.

1. The State taxes most purchases at a rate of \$6 for every \$100.

Solution: The rate of \$6 for every \$100 represents 6 parts per 100.

Answer: a. 6% b. $\frac{6}{100}$

2. A local store received 3 defective VCRs in a shipment of 25 VCRs.

Solution: Three defective VCRs in 25 equates to a failure rate of 12 for every 100.

Answer: a. 12% b. $\frac{12}{100}$

- A. State (a) the percent represented by each of the following situations, then (b) write this percent as a fraction with a denominator of 100. Refer to Sample Problem 1 is needed.

1. A credit card company charges \$18 for every 100 dollars charged.
2. Of twenty people responding to a survey, eight were teenagers.

SAMPLE PROBLEM 2 WITH SOLUTION

(a) Explain the meaning of the percent used in each of the following situations, then (b) write this percent as a fraction with a denominator of 100.

1. In 1995, national defense accounted for about 18% of the federal budget.

Answer: a. Of every \$100 in the 1995 federal budget, \$18 was earmarked for national defense.

b. $\frac{18}{100}$

2. Jim's mutual fund yielded a return of 15% last year.

Answer: a. Jim made \$15 for each \$100 he had invested in his mutual fund last year.

b. $\frac{15}{100}$

- B. (a) Explain the meaning of the percent used in each of the following situations, then (b) write this percent as a fraction with a denominator of 100. Refer to Sample Problem 2 as needed. For more practice, see page 98 of Contemporary's Number Power 2 work-text.

1. In 1995, about 11% of the federal budget was set aside for Medicare.
2. According to the 1990 census, approximately 9% of the people living in the United States are of Hispanic origin.

- C. Draw a sketch that represents the percent used in Problem B1. [Remember, a percent is just a special fraction.]

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III. CONVERTING AMONG FRACTIONS, DECIMALS, AND PERCENTS

SAMPLE PROBLEM 3: SUMMARY OF FRACTION, DECIMAL. AND PERCENT CONVERSIONS

1. CHANGING A FRACTION TO A DECIMAL

To change a fraction to a decimal, divide the denominator (bottom) into the numerator (top).

Example: Change $\frac{4}{25}$ to a decimal

Solution: Divide 25 into 4.
$$\begin{array}{r} .16 \\ 25 \overline{)4.00} \\ \underline{25} \\ 150 \\ \underline{150} \\ 0 \end{array}$$

This works because, by definition, the fraction bar indicates division. Thus, $\frac{4}{25}$ means “4 divided by 25.”

Answer: $\frac{4}{25} = .16$ as a decimal

2. CHANGING A DECIMAL TO A PERCENT

To change a decimal to a percent, multiply the decimal by 100. (The end result is that the decimal point moves **two places to the right**.)

Example: Change .23 to a percent

Solution: Multiply .23 by 100.
$$\begin{array}{r} .23 \\ \times 100 \\ \hline 23.00 \end{array}$$

This works because percent means “per hundred” which is the same as saying “divided by 100.” Thus, to go from decimal notation to percent notation we must “undo” the division.

Answer: $.23 = 23\%$

3. CHANGING A PERCENT TO A DECIMAL

To change a percent to a decimal, divide the percent by 100. (The end result is that the decimal point moves **two places to the left**.)

Example: Change 35% to a decimal

Solution: Divide 35 by 100.
$$\begin{array}{r} .35 \\ 100 \overline{)35.00} \\ \underline{30} \\ 500 \\ \underline{500} \\ 0 \end{array}$$

This works because percent means “per hundred” which is the same as saying “divided by 100.” Thus, 35% means “35 divided by 100.” (Notice that for whole numbers the decimal point is understood to come at the end of the number.)

Answer: $35\% = .35$

4. CHANGING A DECIMAL TO A FRACTION

To change a decimal to a fraction: (1) re-write the number as a fraction with a denominator of 1, (2) multiply the numerator and denominator by a power of ten that will change the numerator to a whole number (use a 1 followed by the same number of zeros as there are digits to the right of the decimal point), and (3) reduce the fraction to lowest terms.

Example: Change 0.235 to a fraction in lowest terms

Solution: Re-write 0.235 as $\frac{0.235}{1}$

Multiply Top & Bottom by 1000
$$\frac{0.235}{1} \times \frac{1000}{1000} = \frac{235}{1000}$$

Reduce:
$$\frac{235}{1000} = \frac{47}{200}$$

Answer: $0.235 = \frac{47}{200}$

In step (1) we are dividing by 1 and in step (2) we are multiplying by 1 (since $\frac{1000}{1000}$ means “1000 divided by 1000”). Thus, we have not changed the value of the number – only the way it looks. As proof, divide 47 by 200 to get 0.235.

Refresher Math Problem Set C1 – Percent Basics

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- A. For each of the following: (a) change the given fraction or mixed number to a decimal; then (b) change the resulting decimal to a percent. Refer to Sample Problem 3 as needed. For more practice, see pages 99, 101, and 103 of Contemporary's Number Power 2 work-text.

1. $\frac{1}{4}$ 2. $\frac{2}{3}$ 3. $3\frac{4}{5}$ 4. $\frac{11}{8}$ 5. $12\frac{5}{6}$ 6. $\frac{5}{7}$

- B. For each of the following: (a) change the given percent to a decimal; then (b) change the resulting decimal to a fraction or mixed number in lowest terms. Refer to Sample Problem 3 as needed. For more practice, see pages 100 and 102 of Contemporary's Number Power 2 work-text.

1. 75% 2. 32% 3. $33\frac{1}{3}\%$ 4. 246% 5. 53.5% 6. 120.6%

IV. FINDING THE PERCENT OF A NUMBER

SAMPLE PROBLEM 4: WITH SOLUTION

Solve each of the following.

1. 18% of 84 =

Solution: 1. The word “of” indicates multiplication. Thus, we get..... $18\% \bullet 84 =$

2. Converting 18% to a decimal, we get..... $.18 \bullet 84 = 15.12$

2. $33\frac{1}{3}\%$ of 126 =

Solution: 1. The word “of” indicates multiplication. Thus, we get..... $33\frac{1}{3}\% \bullet 126 =$

2. Converting $33\frac{1}{3}\%$ to a fraction, we get..... $\frac{1}{3} \bullet 126 = 42$

- A. Solve each of the following. Refer to Sample Problem 4 as needed. For more practice, see pages 104–106 of Contemporary's Number Power 2 work-text.

1. 10% of 63 =

2. $66\frac{2}{3}\%$ of 189 =

3. 9.6% of 257 =

4. 235% of 20 =

5. 0.06% of 5000 =

6. $22\frac{3}{8}\%$ of 640 =

V. PERCENT APPLICATIONS – PART 1 (FINDING THE PERCENT OF A NUMBER)

SAMPLE PROBLEM 5 WITH SOLUTION

The Problem:

Three hundred fifty students graduated from Hometown High this year. If 48 percent of those graduating were boys, how many boys graduated from Hometown High?

The Solution:

i. We are to find how many boys graduated from Hometown High this year.

ii. We know that 48% of the 350 graduates were boys. Remembering that “of” means “times”, we see that the number of boys is given by: $48\% \bullet 350 = .48(350) = 168$

iii. One hundred sixty-eight boys graduated from Hometown High this year.

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SAMPLE PROBLEM 6 WITH SOLUTION

The Problem:

Use the Simple Interest Formula ($I = PRT$, where I = interest, P = principle, R = interest rate, and T = time) to see how much interest you would earn if you invested \$2000 for 30 months at 4.5% simple annual interest.

The Solution:

- i.* We are to find how much interest you would earn if you invested \$2000 for 30 months at 4.5% simple annual interest.
- ii.* From the information given we know:
 $P = 2000$, $R = 4.5\% = 0.045$, and $T = 30$ months = 2.5 years.
Substituting into the formula, we get: $I = 2000 * 0.045 * 2.5 = 225$
- iii.* We would earn \$225 in 30 months.

COMPLETELY SOLVE PROBLEMS A THROUGH H USING STEPS (i), (ii), AND (iii) BELOW. REFER TO SAMPLE PROBLEMS 5 AND 6, AS NEEDED. FOR MORE PRACTICE, SEE PAGES 107–109 AND 150-153 OF CONTEMPORARY’S NUMBER POWER 2 WORK-TEXT.



- i.* State what it is you are to find. Give your answer as a complete sentence.
 - ii.* Solve the problem, showing your work.
 - iii.* State the answer in a complete sentence.
- A. Most real estate agencies charge a 7 percent commission for selling a house. How much would you have to pay in commissions if your house sold for \$72,500?
 - B. A sweater that normally sells for \$42 is on sale at “35% off.” How much will you save if you buy the sweater on sale?
 - C. Gary puts 15% of his take-home pay into savings. If his paycheck this week was \$568, how much should he put into savings? Round your answer to the nearest dollar.
 - D. Bargain Mart requires a 20% down payment on all layaways. How much would you have to put down on a camcorder that costs \$625 with tax?
 - E. If, on average, it either rains or snow on 38.2 percent of the days each year, how many days does it rain or snow in an average 365-day year? Give your answer to the nearest whole day.
- USE THE SIMPLE INTEREST FORMULA ($I = PRT$, WHERE I = INTEREST, P = PRINCIPLE, R = INTEREST RATE, AND T = TIME) TO ANSWER PROBLEMS F, G, AND H.
- F. Mary invested \$2500 for one year at an annual rate of 5.75% (simple interest). How much did she earn in interest?
 - G. Terry borrowed \$1200 for 8 months at 12% per year simple interest. How much interest did he have to pay on this loan?
 - H. How much interest would you earn if you invested \$1500 at 5.5% simple interest for 12 years?

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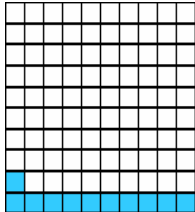
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ANSWER KEY

SECTION I: REVIEW PROBLEMS

- A1.  A2.  A3. $\frac{3}{5}$ A4. $5\frac{3}{4}$
- A5. $6\frac{7}{20}$ A6. $5\frac{3}{20}$ A7. $3\frac{9}{20}$ A8. $9\frac{7}{12}$
- B1. 0.6 B2. 5.75 B3. $\frac{139}{500}$ B4. $25,216\frac{273}{500}$
- B5. twenty-five thousand two hundred sixteen and five hundred forty-six thousandths
- B6a. 25,216.5 B6b. 25,220 B6c. 25,216.55 C. 37.088
- D. 54.1512 E. 18 F. 37 G. $3\frac{1}{3}$
- H. \$7.05 I. $4\frac{31}{40}$ J. 2 K. $3\frac{15}{16}$
- L. $1\frac{2}{3}$ cups M. $9\frac{1}{3}$ cups N. 15 girls O. 316.8 miles
- P. $42\frac{7}{8}$ inches Q. \$7.35 R. $2\frac{5}{8}$
- S1. 3.8 cm S2. 9.1 cm

SECTION II: THE MEANING OF PERCENT

- A1a. 18% A1b. $\frac{18}{100}$ A2a. 40% A2b. $\frac{40}{100}$
- B1a. In 1995, \$11 of every \$100 of the federal budget was earmarked for Medicare. B1b. $\frac{11}{100}$
- B2a. In 1990, about 9 of every 100 people living in the United States was of Hispanic origin. B2b. $\frac{9}{100}$ C. 

SECTION III: CONVERTING AMONG FRACTIONS, DECIMALS, AND PERCENTS

- A1a. 0.25 A1b. 25% A2a. $0.\overline{666}$ A2b. $66.\overline{6}\%$
- A3a. 3.8 A3b. 380% A4a. $1.\overline{375}$ A4b. 137.5%
- A5a. $12.\overline{83}$ A5b. $1283.\overline{3}\%$ A6a. $\overline{.714285}$ A6b. 71.4285714285%
- B1a. $0.\overline{75}$ B1b. $\frac{3}{4}$ B2a. 0.32 B2b. $\frac{8}{25}$
- B3a. $0.\overline{3}$ B3b. $\frac{1}{3}$ B4a. 2.46 B4b. $2\frac{23}{50}$
- B5a. 0.535 B5b. $\frac{107}{200}$ B6a. 1.206 B6b. $1\frac{103}{500}$

SECTION IV: FINDING THE PERCENT OF A NUMBER

- A1. 6.3 A2. 126 A3. 24.672 A4. 47
- A5. 3 A6. 143.2

SECTION V: PERCENT APPLICATIONS – PART 1

- A. \$5,075 B. \$14.70 C. \$85 D. \$125
- E. 139 days F. \$143.75 G. \$96 H. \$990

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